Recent achievements at Metsähovi Radio Observatory

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Background

- VLBI: High-speed, high-volume data acquisition
- Correlated in special HW correlators, until now computers have been too slow.
- Five years ago hard disks replaced the tape recorders

The Metsähovi correlator engine

- Developed for the Cell processor (Sony Playstation 3) in 1H 2007
- About ten times more powerful than Intel-based solutions
- Less platform-dependent: Only a few pages of code need to be rewritten if platform changes
- Needs high-speed input data

Problem(s):

- Getting data in and out of specialised disk controller and old PATA disk packs is slow
- Data input is moving to 10 Gbps Ethernet when iBob or DBBC are used
- Testing four-Gbps streaming is easier with four-Gbps recorder
- The seven-year-old VLBI data recorder designs would benefit from speedup

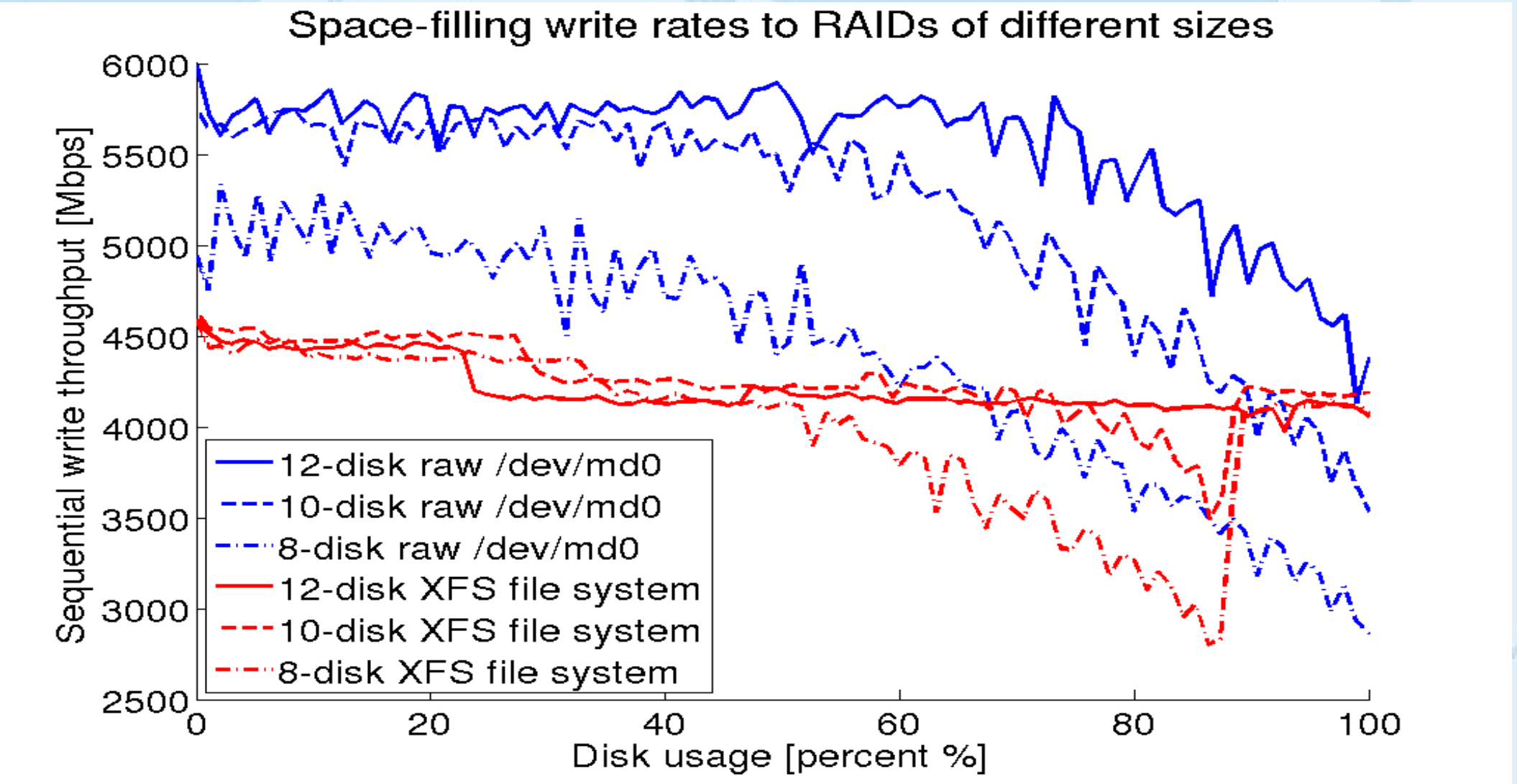
Solution:

- Feasibility study: a four-Gbps recorder made from only commercial off-the-shelf components
- 10 Gbps Ethernet for input/output
- Fast international data streaming using the Tsunami protocol
- Fallback plan: If it does not work at four Gbps, use two at two Gbps each

Disk subsystem tests

- Original tests with 12-disk raid array, one-year-old Seagate 250 GB disks
- Best write speed with ext2 fs 5.5Gbps, decreases to half of that on inner tracks
- Replaced the disks to newest and fastest Samsung Spinpoint F1 750 GB
- Consistent > 4Gbps performance

Samsung 750GB disk performance



10 Gbps Ethernet tests

- Equipment: Myrinet and Chelsio NICs
- Initial iperf tests: 2-3 Gbps, 100% CPU
- Improved to 8 Gbps with jumbo frames
- Turned off udp checksum, Ethernet has already one.
- Final iperf UDP results:
  - MTU 1500: 4.88 Gbps
  - MTU 4470: 8.55 Gbps
  - MTU 9000: 9.04 Gbps

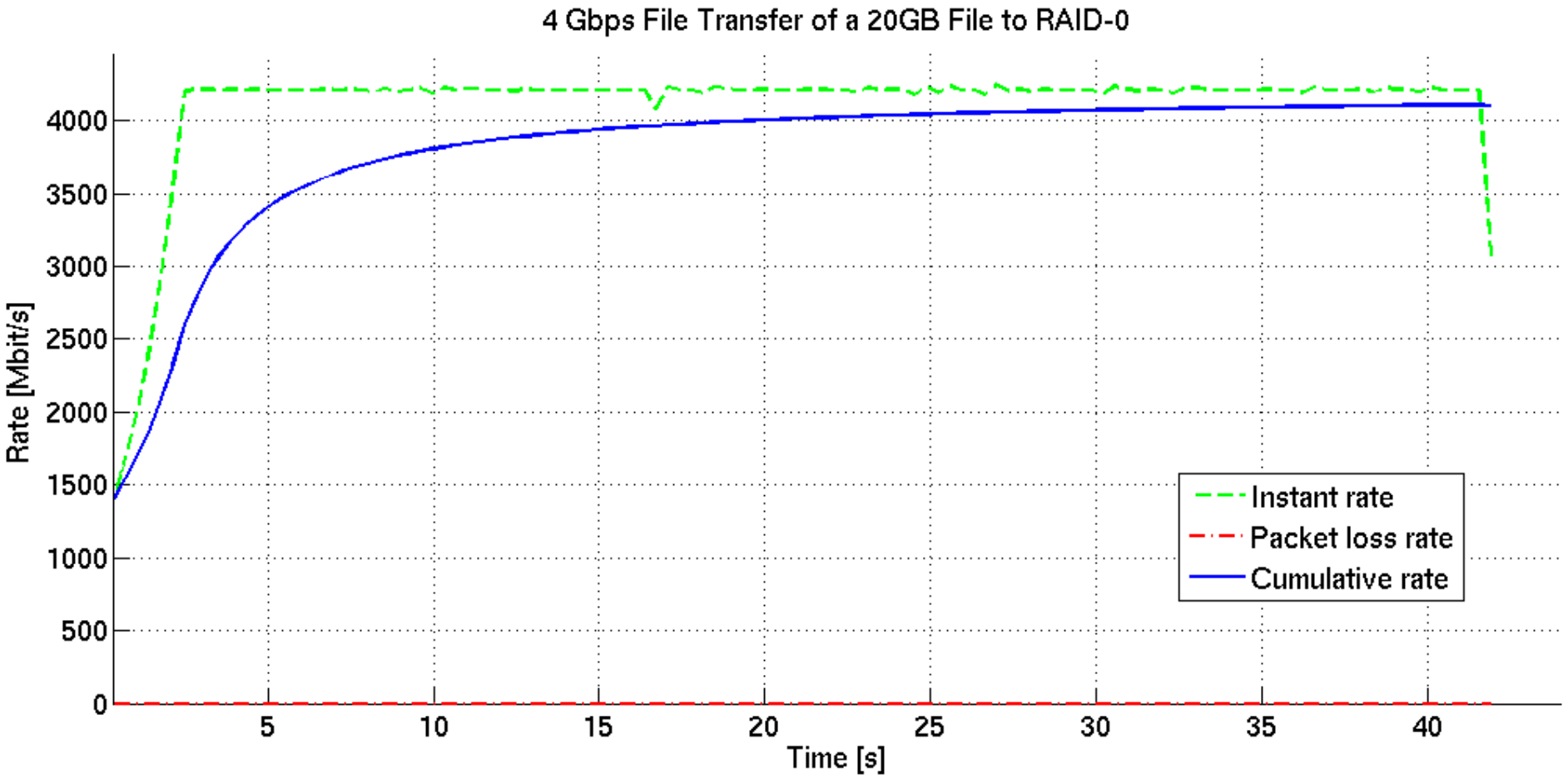
Combined 10GBE + disks

- Both tasks are CPU-limited
- Used two dual-core AMD 2212 processors and threads to divide the load
- Optimum performance with two six-disk raid arrays and two udp streams
- Sustained 4 Gbps transfer from 10GBE to disks

Tsunami tests

- Four-Gbps tsunami would be very useful
- ...so would be direct transfer from iBob udp/ip packetizer to correlator...
- A single tsunami transfer runs at 4 Gbps, two parallel transfers are a little faster
- And: Zero packet loss!!!

Lossless 4 Gbps Tsunami transfer



Scientific results

- Maser and Kronian water observations (Pogrebenko & al)
- Venus Express and Mars Express spacecraft tracking
- 8 Gbps eVLBI demonstration in the 7th eVLBI workshop, Shanghai